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(54) Title: WRINKLE REDUCTION LAUNDRY PRODUCT COMPOSITIONS		
(57) Abstract <p>The present application relates to the inclusion of one or more wrinkle reducing ingredients in a laundry fabric softening product. The benefits are delivered to the laundered item either during the rinse step of the washing procedure or in the dryer. The need for further wrinkle reducing steps when the items are taken from the dryer or after hang drying are thereby reduced. The wrinkle reducing ingredients may be chosen from ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers or from wrinkle reducing compounds that do not have a net positive charge when in neutral or alkaline medium.</p>		

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WRINKLE REDUCTION LAUNDRY PRODUCT COMPOSITIONS

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Technical Field

10 The present invention relates to wrinkle reduction laundry product formulations and to methods of reducing the occurrence of wrinkles in laundered clothing.

Background and Prior Art

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When textiles, such as clothing, linens and the like, are laundered, it is typically desired that wrinkles be eliminated or minimized after the cleaning and drying process. Mechanical wrinkle reduction techniques, such as
20 heat and pressure (for example, ironing), have been used but can be time consuming and inconvenient.

Known attempts to reduce wrinkles by means of chemical ingredients in the wash include the use of zwitterionic
25 surfactants, aminosilicones, curable aminosilicones, cellulase enzymes and alkyl amides. However, each of these ingredients have one or more drawbacks. For example, zwitterionic surfactants are believed to work best in cold water. Aminosilicones can cause yellowing and can be
30 difficult to formulate. Curable aminosilicones require the heat of an iron to reduce wrinkles. Cellulase enzymes generally require several wash cycles before anti-wrinkle benefits become noticeable. Alkyl amides are not very effective relative to other wrinkle reducing agents.

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Liquid fabric softeners have been sold commercially since the late 1950's. They are preferably formulated to provide softening and fragrance benefits to fabrics (primarily cottons and cotton blends) when used in the rinse cycle of a washing machine. Liquid fabric softeners are generally formulated by making an aqueous dispersion of one or more cationic surfactants in water. The cationic surfactants are typically quarternized organonitrogen compounds that contain one or more, preferably two, long carbon chains attached to one or more nitrogen atoms. This material provides the primary softening benefit by depositing from the rinse solution onto the fabrics. Additional materials typically used in these formulations include preservatives, pH control agents, viscosity modifying salts, perfumes, optical brighteners, colourants and colour care agents.

By purchasing and using liquid fabric softeners, the consumer is clearly interested in achieving fabric care benefits over and above those provided by known laundry detergents. Because wrinkles are generally undesirable, a liquid fabric softener that also decreases or eliminates wrinkles would be a welcomed additional benefit.

Therefore, there is a need and perceived benefit for an effective and efficient means for eliminating or reducing wrinkles in textiles. To be effective and efficient, the ingredient should preferably work across a broad range of water temperatures, not require the use of an iron, have little to no discolouration effect on the laundered item and/or provide a noticeable wrinkle reducing benefit after relatively few wash cycles.

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- Consumer products are also available that deliver softening and static control benefits in the dryer. Typically, these are in the form of fabric dryer sheets and are available
- 5 under the tradenames Snuggle (Unilever) and Downy (Procter & Gamble). While these products deliver desired benefits, additional benefits, such as wrinkle reduction, would also be desirable.
- 10 Therefore, there is also a need for wrinkle reducing agents that can deliver such benefits from dryer sheets.

Definition of the Invention

- 15 Accordingly, the present invention provides in an first embodiment a liquid fabric softening formulation comprising one or more wrinkle reducing agents selected from the group consisting of: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear
- 20 aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers.
- 25 The invention further provides a detergent formulation comprising one or more quaternized organonitrogen compounds, fragrance, colourant, water and an effective amount of at least one wrinkle reducing providing a liquid fabric softening formulation comprising at least one wrinkle
- 30 reducing agent for reducing the occurrence of wrinkles in laundered clothing, the at least one wrinkle reducing agent being selected from the group consisting of: ethoxylated

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organosilicones; polyalkyleneoxide modified
polydimethylsiloxane; linear aminopolydimethylsiloxane
polyalkyleneoxide copolymers; sulphated/sulphonated
vegetable oils; high molecular weight polyacrylamides;
5 betaine siloxane copolymers; and alkylactam siloxane
copolymers.

The invention further provides a liquid fabric softening
formulation comprising an effective amount of a wrinkle
10 reducing agent for reducing the occurrence of wrinkles in
laundered clothing, the wrinkle reducing agent being a
compound that does not have a net positive charge when in an
alkaline medium.

15 The invention further provides a method of reducing the
occurrence of wrinkles in laundered clothing comprising:

- i) providing a liquid fabric softening formulation
comprising at least one wrinkle reducing agent selected
20 from the group consisting of: ethoxylated
organosilicones; polyalkyleneoxide modified
polydimethylsiloxane; linear aminopolydimethylsiloxane
polyalkyleneoxide copolymers; sulphated/sulphonated
vegetable oils; high molecular weight polyacrylamides;
25 betaine siloxane copolymers; and alkylactam siloxane
copolymers; and
- ii) contacting the formulation with clothing subsequent to
a washing procedure; and
- 30 iii) allowing the clothing to dry;

- 5 -

wherein the laundered clothing has fewer wrinkles present than clothing laundered and dried in a similar manner with a liquid softening formulation that excludes the at least one wrinkle reducing agent.

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The invention further provides a method of reducing the occurrence of wrinkles in laundered clothing comprising:

- 10 i) providing a liquid fabric softening formulation comprising at least one wrinkle reducing agent selected from compounds that do not have a net positive charge; and
- 15 ii) contacting the formulation with clothing subsequent to a washing procedure; and
- iii) allowing the clothing to dry;

20 wherein the laundered clothing has fewer wrinkles present than clothing laundered and dried in a similar manner with a liquid fabric softening formulation that excludes the at least one wrinkle reducing agent.

The invention further provides a dryer sheet comprising a
25 substrate and one or more wrinkle reducing agents selected from the group consisting of; ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight
30 polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers.

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The invention further provides a method of reducing the occurrence of wrinkles in laundered clothing comprising:

- 5 i) providing a dryer sheet comprising at least one
 wrinkle reducing agent selected from the group
 consisting of: ethoxylated organosilicones;
 polyalkyleneoxide modified polydimethylsiloxane;
 linear aminopolydimethylsiloxane polyalkyleneoxide
10 copolymers; sulphated/sulphonated vegetable oils;
 high molecular weight polyacrylamides; betaine
 siloxane copolymers; and alkylactam siloxane
 copolymers; and
- 15 ii) contacting the dryer sheet with clothing in a
 drying procedure subsequent to a washing
 procedure;

 wherein the clothing has fewer wrinkles present than
20 clothing laundered and dried in a similar manner with a
 dryer sheet that excludes the at least one wrinkle
 reducing agent.

Detailed Description of the Invention

25 The present application relates in one embodiment to the
 inclusion of one or more wrinkle reducing ingredients in a
 liquid fabric softening product. The benefits are delivered
 to the laundered item during the rinse step of the laundry
30 cycle (when the fabric softener is typically added) and,
 therefore, reduces the need for further wrinkle reducing

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steps when the items are taken from the dryer or after hang drying. The present application also relates to the inclusion of one or more wrinkle reducing ingredients in dryer sheets.

5

The ingredients that facilitate the benefit of wrinkle reduction are believed to lubricate fibre surfaces. By lubricating the fibre surfaces of garments, for example, the fibres slide more easily relative to each other and are less likely to entangle, resulting in less wrinkles. The preferred fibre lubricants disclosed herein have been shown to noticeably reduce the number of wrinkles. The preferred embodiments also overcome one or more of the above noted disadvantages of prior wrinkle reducing agents or methods.

15

LIQUID FABRIC SOFTENER FORMULATIONS

Several molecules have been identified for wrinkle reduction benefits when included in known liquid fabric softener formulations. Using the American Association of Textile Chemists and Colorists (AATCC) method # 124 (described in greater detail, below), the following molecular classes were found to reduce the number of wrinkles on test cloths: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers. Of the foregoing, the most preferred wrinkle reducing agent is a linear aminopolydimethylsiloxane polyalkyleneoxide copolymer sold under the name Magnasoft

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SRS (available from Witco, Greenwich, CT, USA). Silsoft A-843, another aminopolydimethylsiloxane polyalkyleneoxide copolymer available from Witco, is also a particularly preferred wrinkle reducing agent. Another preferred class
5 of wrinkle reduction compounds are sulphated castor oils sold, for example, under the tradename Freedom SCO-75 (available from Freedom chemical Co., Charlotte, NC, USA).

One or more of the molecules/compounds from the above-
10 identified classes are preferably included in known fabric softener formulations in an amount from about 0.1 to about 10 wt %, about 0.1 wt % to about 5 wt %, about 0.3 to about 1.5 wt % and, most preferably, from about 0.3 wt % to about 5 wt %. Suitable liquid fabric softener formulations are
15 described, for example, in U.S. Patent Nos.: RE 34,062 (Wells); 5,288,417 (Bauer et al.); 5,403,499 (Kiefer et al.); 5,411,671 (Bauer et al.); 5,460,736 (Trinh et al.); 5,545,350 (Baker et al.); and 5,562,849 (Wahl et al.), all of which are incorporated herein by reference.

20 An additional advantage of the above-identified wrinkle reducing ingredients is that the molecules/compounds do not have a net positive charge in a neutral or alkaline medium, i.e. a medium having a pH greater than or equal to about
25 6.5. Lack of a net positive charge reduces the likelihood that precipitates will result when the above-identified wrinkle reducing ingredients come in contact liquid detergents containing anionic surfactants, such as in the
rinse cycle of the laundering process. More specifically,
30 they are less likely to precipitate with negatively charged surfactants.

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DRYER SHEET

Dryer sheets are well known in the art. They generally
5 include a substrate, upon which active ingredients are
disposed. The dryer sheet is typically added to a hot air
dryer with wet clothing after a laundering cycle. The
present disclosure relates to the addition of one or more
wrinkle reducing agents to known dryer sheet formulations.
10 The wrinkle reducing agents can be added from about 0.1 wt %
to about 25 wt %. Higher wt % levels of wrinkle reducing
agents for dryer applications are desirable because it
typically takes higher wt % levels of active ingredients in
the dryer, such as with dryer sheets, to deliver the
15 benefits to the same weight of fabrics as compared to a
rinse conditioner. In use, the dryer sheet is preferably
added to a hot air clothes dryer with damp clothing. The
sheet is allowed to come in contact with the clothing during
the drying cycle. During this contact, ingredients disposed
20 on the dryer sheet, such as the wrinkle reducing agents, are
transferred to the clothing.

In a most preferred embodiment, the wrinkle reducing agent
is a linear aminopolydimethylsiloxane polyalkyleneoxide
25 copolymer or a sulphated castor oil. In addition, perfume
is preferably added in a range from about 1 wt % to about 4
wt %, wherein about 2.5 wt % is most preferred. The fabric
sheet formulation is applied to the substrate and packaged
for use.

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Test Method

A preferred method of measuring wrinkle reduction is by using the American Association of Textile Chemists and Colorists' (AATCC) method # 124, Appearance of Fabrics after Repeated Home Laundering. In this method, four cloth types (silk, rayon, cotton, and linen) are washed, dried and stored in a well defined way. The dried cloths are then evaluated for wrinkle content by comparison with wrinkle smoothness replicas which can be purchased from AATCC. Factors such as the light used, the angle of the cloths and replicas to the light, and the background are carefully controlled and described in the method. There are six replicas with values of 1, 2, 3, 3.5, 4, and 5 with 5 being perfectly smooth and 1 being very wrinkled. Three trained observers are asked to give a value of 1-5, to the nearest 0.5 unit, to each cloth based on which replica it most closely resembles. The results are totalled and averaged over the three observers for each cloth type. According to the method, a difference of > 0.17 between the results for two products indicates there is a significant difference at the 95% confidence level. A difference of greater than or equal to 0.25 indicates a significant difference at the 99% confidence level.

25

The formulations of the invention may be prepared by any suitable method, including, the method referred to below under the table showing Formulation 5.

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Examples

The invention will be further illustrated by the following examples. Further modifications within the scope of the present invention will be apparent to the person skilled in the art.

Formulations 1 to 5 inclusive are liquid fabric softener formulations. Formulation 6 is a dryer sheet formulation.

10

Formulation 1

Ingredient	Percent in Formula (by weight)
Ditallow dimethyl ammonium chloride (Arquad 2HT)	6.5
Amido amine ethoxylates (Accosoft 460)	17.7
Lactic acid	0.22
Glutaraldehyde	0.07
Fragrance	0.7
Calcium chloride	0.2
Magnasoft SRS*	0.5
Colourants	(ppm)
Water	to 100%

*Wrinkle reduction agent - a linear aminopolydimethylsiloxane polyalkyleneoxide copolymer from Witco Chemical Co.

The following formulation containing a wrinkle reduction ingredient was produced:

20

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Formulation 2: The same as formulation 1 without the wrinkle reduction agent present.

Laboratory tests have shown wrinkle reduction benefits for
5 Formulation 1 are greater than that of Formulation 2.

Wrinkle Test Results

Using the AATCC fabric smoothness test method as described
10 above, several fabric types were laundered using either
formulation 1 with Magnasoft SRS at .5% or the same
formulation without any wrinkle reduction additive
(Formulation 2). Results of the testing after four
laundrying cycles show wrinkle reduction benefits with use
15 of Magnasoft SRS (Formulation 1) on rayon, silk, linen and
100% cotton. The results are significant at the 95%
confidence level.

Fabric Smoothness Scores

20

	Silk	Rayon	Linen	Cotton
Form. 1	3.28	2.11	2.72	2.20
Form. 2	3.00	1.78	2.28	1.89

25 The following are other preferred formulations containing at
least one wrinkle reducing agent:

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Formulation 3

Ingredient	Percent in Formula (by weight)
Ditallow dimethyl ammonium chloride (Arquad 2HT)	6.5
Amido amine ethoxylates (Accosoft 460)	17.7
Lactic acid	0.22
Glutaraldehyde	0.07
Fragrance	0.7
Calcium chloride	0.2
Magnasoft SRS*	3.0
Colourants	(ppm)
Water	to 100%

- 5 * Wrinkle reduction agent - a linear aminopolydimethylsiloxane polyalkyleneoxide copolymer from Witco Chemical Co.

Formulation 4

Ingredient	Percent in Formula (by weight)
Ditallow dimethyl ammonium chloride (Arquad 2HT)	6.5
Amido amine ethoxylates (Accosoft 460)	17.7
Lactic acid	0.22
Glutaraldehyde	0.07
Fragrance	0.7
Calcium chloride	0.2
Freedom SCO-75*	1.0%
Colourants	(ppm)
Water	to 100%

10

- * Wrinkle reduction agent - a sulphated castor oil from Freedom Chemical Company.

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Formulation 5

Ingredient	Percent in Formula (by weight)
Ditallow dimethyl ammonium chloride (Arquad 2HT)	6.5
Amido amine ethoxylates (Accosoft 460)	17.7
Lactic acid	0.22
Glutaraldehyde	0.07
Fragrance	0.7
Calcium chloride	0.2
Freedom SCO-75*	4.0%
Colourants	(ppm)
Water	to 100%

- 5 * Wrinkle reduction agent - a sulphated castor oil from Freedom Chemical Company.

Preferred Method of Formula Preparation

- 10 The above cited formulas were prepared as follows: The quaternary fabric softener actives were mixed together under moderate agitation and heated to 160degrees F (approximately 71°C). The water and some minor ingredients (colourants and preservatives) were combined in a second mixing vessel and
15 were also heated to 160 degrees F (approximately 71°C). The two mixes were then combined by addition of the actives premix to the main batch under vigorous agitation. Viscosity control salts were added to the mixture in several increments while the batch was cooled to 100 degrees F
20 (approximately 38°C). The fragrance and the wrinkle reduction compounds were then added under moderate

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agitation and the batch was further cooled to room temperature. The resultant product was uniform and free flowing and remained stable and pourable over time.

5 **Formulation 6 - Formulation for a Dryer Sheet**

Ingredient	Percent in Formula (by weight)
Free Fatty Acid	46.8
Wrinkle reducing agent	10
Nonionic Surfactant	22.5
Potassium Soap	16.2
Water	4.5

The above example presents a formulation having 10 wt % wrinkle reducing agent for a dryer sheet:

10

All component percentages herein are by weight based upon the total weight of the composition, unless otherwise indicated. All numerical values are considered to be modified by the term "about" and should be given the

15 broadest available range of equivalents when construing the claims.

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CLAIMS

1. A liquid fabric softening formulation comprising one or more wrinkle reducing agents selected from the group consisting of: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers.
2. The formulation according to claim 1, wherein the wrinkle reducing agent is a linear aminopolydimethylsiloxane polyalkyleneoxide copolymer or a sulphated castor oil.
3. The formulation according to claim 1, wherein at least one of the wrinkle reducing agents is present in the formulation in an amount from about 0.1 wt % to about 10 wt % of the formulation, preferably in an amount from about 0.3 wt % to about 5 wt % of the formulation, most preferably in an amount from about 0.5 wt % to about 3.0 wt % of the formulation.
4. A detergent formulation comprising one or more quarternized organonitrogen compounds, fragrance, colourant, water and an effective amount of at least one wrinkle reducing providing a liquid fabric softening formulation comprising at least one wrinkle reducing agent for reducing the occurrence of wrinkles in laundered clothing, the at least one wrinkle

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reducing agent being selected from the group consisting of: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers.

5. The formulation according to claim 4, wherein the wrinkle reducing agent is a linear aminopolydimethylsiloxane polyalkyleneoxide copolymer or a sulphated castor oil.
6. A liquid fabric softening formulation comprising an effective amount of a wrinkle reducing agent for reducing the occurrence of wrinkles in laundered clothing, the wrinkle reducing agent being a compound that does not have a net positive charge when in an alkaline medium.
7. A method of reducing the occurrence of wrinkles in laundered clothing comprising:
 - i) providing a liquid fabric softening formulation comprising at least one wrinkle reducing agent selected from the group consisting of: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine

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siloxane copolymers; and alkylactam siloxane
copolymers; and

5 ii) contacting the formulation with clothing
subsequent to a washing procedure; and

iii) allowing the clothing to dry;

10 wherein the laundered clothing has fewer wrinkles
present than clothing laundered and dried in a similar
manner with a liquid softening formulation that
excludes the at least one wrinkle reducing agent.

15 8. A method of reducing the occurrence of wrinkles in
laundered clothing comprising:

20 i) providing a liquid fabric softening formulation
comprising at least one wrinkle reducing agent
selected from compounds that to do not have a net
positive charge; and

ii) contacting the formulation with clothing
subsequent to a washing procedure; and

25 iii) allowing the clothing to dry; wherein the
laundered clothing has fewer wrinkles present
than clothing laundered and dried in a similar
manner with a liquid fabric softening formulation
that excludes the at least one wrinkle reducing
30 agent.

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9. A dryer sheet comprising a substrate and one or more wrinkle reducing agents selected from the group consisting of: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers.
10. The dryer sheet according to claim 9, wherein the wrinkle reducing agent is a linear aminopolydimethylsiloxane polyalkyleneoxide copolymer or a sulphated castor oil.
11. The dryer sheet according to claim 9, wherein at least one of the wrinkle reducing agents is present in the formulation in an amount from about 0.1 wt % to about 25 wt % of the formulation.
12. A method of reducing the occurrence of wrinkles in laundered clothing comprising:
- i) providing a dryer sheet comprising at least one wrinkle reducing agent selected from the group consisting of: ethoxylated organosilicones; polyalkyleneoxide modified polydimethylsiloxane; linear aminopolydimethylsiloxane polyalkyleneoxide copolymers; sulphated/sulphonated vegetable oils; high molecular weight polyacrylamides; betaine siloxane copolymers; and alkylactam siloxane copolymers; and

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ii) contacting the dryer sheet with clothing in a drying procedure subsequent to a washing procedure;

5. wherein the clothing has fewer wrinkles present than clothing laundered and dried in a similar manner with a dryer sheet that excludes the at least one wrinkle reducing agent.